

to show the boundaries of the forests, the position of each boundary-mark, of the several private properties touching the forest boundaries, and all internal sub-divisions of a forest block with their respective boundaries. The 8 inches scale is quite large enough to serve all these purposes, and it is none too large; it does not give unwieldy maps. Moreover, it corresponds with the scale of the Bombay Revenue Survey Department; and the advantage of having forest maps upon the same scale as the village maps is a decided recommendation. In France the scale of the forest surveys are  $6\frac{1}{2}$  inches and  $12\frac{3}{4}$  inches to the mile. The forest survey last season in the Thána District made no very great progress—only  $52\frac{1}{2}$  square miles having been plane-tabled and mapped, the hill contours having been arrived at by water-levelling. 544 stations were trigonometrically determined, extending over an area of 107 square miles; and 156 linear miles of traverse work along forest reserve boundaries was undertaken.  $12\cdot5$  square miles of the surveyed area lies in the Sálsette Range and the remainder in the Kalyán Range. But the cost came to Rs. 257 per square mile. This was very heavy, and it is attributed by Colonel Pullan to the forest boundaries not having been defined, well in advance of the survey, and to the work being new. In the future, the cost will, it is expected, be very much less. And it is not improbable that with a local forest survey branch, such as the Forest Department of the Government of India have organised, the cost could be reduced to Rs. 120 per square mile.

### (B)—WORKING PLANS.

49. Mr. T. B. Fry, Deputy Conservator of Forests, 3rd Grade, has been in charge of the Working Plans Division throughout the year. The subordinate staff consists of field and office establishments, and they are all borne upon the "*Temporary Establishments*" list. The office establishment comprises 1 clerk on Rs. 40 per mensem and 4 peons on Rs. 8 each. The field staff at the commencement of the year consisted of 4 surveyors, and during the recess, from 1st June, the number was reduced to 2; but when the working season opened in November, the staff was increased to 8 surveyors and 12 enumerators; and in January, when the work of determining the boundaries of forest reservations in the Thána District had to be undertaken, and the demarcation to be pushed on vigorously, 4 more surveyors and 12 mukádams were entertained. The examination of a teak forest of 4,300 acres in extent at Virár, in the Bassein Range, and the preparation of a provisional working plan for its management were completed at the outset by Mr. Fry and his staff. And then the determination of the coupes of the two seasons 1885-86 and 1886-87 in the Thána District, with an estimate of the material exploited and of the growing material left standing, were undertaken, and several test plots were carefully measured in various parts of the forests, and their contents counted and registered according to fixed classifications, in order to arrive at a fairly accurate knowledge of the capability of the forests. It soon became apparent, however, that further work of a similar character could not be satisfactorily carried out, for several reasons, the chief one being that the demarcation of the reservations by distinguishable boundary-marks upon the ground was required to be made in advance, not only of the forest survey, but of the differentiation of forest areas. And at a conference held by the Conservator with the Divisional Forest Officers of North and South Thána, and of Working Plans, at Chandai, in the Thána District, it was decided that the circumstance of the Thána forests required the very early completion of a systematic arrangement of working, maintaining, and improving the entire forest area of the two divisions in preference to very elaborate schemes for limited areas, the preparation of which must necessarily be a work of time; and the delay, that would follow in the disposal of the whole forest area of the entire Collectorate, might be disastrous, for a haphazard system of promiscuous fellings must tend to the deterioration of the growing stock, some areas being overworked and others not worked sufficiently to develop their powers. So long as the axe was directed by fancy and speculative effort, the result could in no way be satisfactory. The condition of the Thána forests does not favour schemes of very scientific elaboration, and the surrounding circumstances point to certain factors which must regulate to a great degree the internal economy of working schemes for the Thána forests. The existence of a large local population depending for subsistence in a great measure upon the labour to be provided by felling, collecting, stacking, exploiting timber and other forest produce, and also making a constant

demand upon the produce of the forest for agricultural and domestic requirements; the country being a succession of lofty hills and narrow valleys, with the forest estates spreading over the hills, and the villages in the valleys intermingling with the forest areas; the teak being the predominating tree in the forest and possessing vigorous powers of reproduction by coppice shoots, the ill-treatment the teak and its associates in the Thána forests have received from man for years past, and consequently the impaired condition of the forests; the great value of all forest produce owing to the demands of a very large local population combined with the demands of the city of Bombay at the door of the forests with a population of 8,00,000, and the city of Poona connected with the forests by railway communication 50 miles distant from the nearest point; the absence of timber of large scantling, and the ready market for small timber, which better serves the necessities of the peasantry, and for every stick of firewood; the facilities afforded by three lines of railway, tidal creeks, and other channels of inland navigation, cart-roads and tracks penetrating up to the head of every valley, and up the sides and summits of many hill ranges, for smuggling timber and robbing the forests; and the very large section of the population who are in league with timber-dealers and ever on the look out to make raids upon the Government forests and run timber into Bombay;—all these considerations point to the location of “coupes” of comparatively small size each at almost regularly recurring distances all over the forest area, the size of a coupe varying according to situation from 30 to 70 acres, so that proper supervision may be exercised over the “exploitation” of their material, under which term besides actual fellings may be included every operation to be performed in the coupe, such as valuation of the crop, marking and registering the reserves, testing the registers after the felling is completed, counting and classification of material extracted, and other minor works; and so that forest villagers and the peasantry generally may not have to go inconvenient distances from their houses for labour, and prohibitive distance in the light of the cost of carriage for their supplies of timber and other forest produce to be obtained free or on payment, and for the enjoyment of pasturage in forests by their cattle; and that a wood-cutting race may find a congenial honest occupation in every direction close at hand, and thus be diverted from plundering the forests which are so exposed on all sides

50. It was decided, after careful investigation into the rate of growth of timbers, and study of the biology of the teak tree in the Thána forests, that a revolution of forty years might safely govern the differentiation of the forest blocks. The length of rotation having thus been fixed, and the approximate size of coupes having been determined, the arrangement and distribution of forest working blocks followed in natural sequence, their extent and position being controlled also to a great extent also by the necessity of obtaining suitable physical boundaries. Mr. Fry and his establishments were thus engaged throughout the year, while employed in the Thána Districts, in—

(a) the demarcation of the forest limits of the settled and unsettled reservations in the Bassein, Sálsette, Kalyán, Bhiwandi, Karjat, and Khálápúr ranges,—14,427 chains of forest boundary lines having been defined by 2,848 special forest boundary-marks;

(b) the differentiation of forest areas over the greater portion of the Collectorate. In consultation with the Divisional Forest Officers, “Reserved Forests,” settled and unsettled, were arranged by Mr. Fry into working blocks varying from 1,000 to 4,000 acres in size upon the topographical survey maps. Unworkable areas, or climatic portions of forest tracts consisting of hill tops, steep precipices, the uppermost slopes of lofty mountains were, according to their special circumstances, excluded, and the workable tracts were sub-divided into compartments;

(c) the selection of the “coupes” for the coming year, their location having been arrived at under the knowledge of fellings made in past years, and of the present state of the forests; coupe maps were prepared on the 8 inches scale, each one being tested and signed by the Divisional Forest Officer of Working Plans, and issued, to be a guide in

(d) the demarcation of the "coupes" upon the ground, their boundaries being defined by special marks;

(e) the estimation of the standing crop of timber in each coupe, and the selection and marking of the reserves which was made by means of serial numbers and two rings of paint round each tree. The subordinate protective establishments of the two divisions under their superior officers co-operated in the demarcation, valuation and selection of reserves, and the registration of the trees to be felled and the trees to be retained.

51. Seeing that the forest area of the two divisions may exceed 1,000 square miles of "Reserved Forests", and that there are upwards of 1,330 forest villages, the marking out of the coupes, of the reserves or standards, and the valuation of the yield is a very laborious and responsible operation. The number of forest blocks is very large, from 30 to 50 in a range. It was not possible to differentiate in this way the entire forest tracts in the whole Collectorate, but the portions not touched last season for the want of more time and money will be done next season.

52. The completion of a simple general scheme of forest working for the whole Collectorate, which is at the same time based upon sound principles of silviculture, is, the Conservator would urge, the best plan to adopt in connection with forest working plans of very extensive areas upon which there is considerable demand for produce, and the condition of which urgently presses for improvement. Elaborate calculations with detailed measurements and enumerations of all and every tree in a forest necessary to arrive at "an inventory of the forest" may be suitable and desirable in connection with the preparation of working plans for small timber estates or specially valuable forest which are free of the exercise of privileges inimical to a proper state of forest conservancy, and have been and may be efficiently protected, but for forests circumstanced as those in the Thána Collectorate a more rough and ready system would appear to be wanted. The number of coupes being large and widely distributed, the greater yield from some will counterbalance the smaller yield from others, and an average yield per acre for purposes of budget estimates can be safely arrived at for the range and for the division which will give a sustained annual yield. The coupes selected for next year are so located as to form the first of a series of ten, which can be worked in succession in such a manner that one-fourth of the working block will be dealt with during one-fourth of the revolution, and when the second rotation comes round, such of the sound growing trees which have now been reserved—their number is small generally—as may then be found to be sound and still maturing will be reserved, with such sound seedlings as may have come up during the interval, for another forty years.

53. During the rainy season, while in recess, Mr. Fry delivered a series of lectures on forestry to the forest class at the College of Science, Poona, and he made a tour with the Divisional Forest Officer, Poona, to the bábul reserves in the valley of the Bhima River, and arranged for a registration of their areas, contents, &c., with the view to the preparation of a working plans for these very valuable properties. Mr. Vishnu Mahádev Tilak, Range Forest Officer of Haveli, performed the necessary work in a very intelligent, careful, and highly creditable manner.

54. In the South Thána Division, compartments were set out in the bed of the Tansa Lake at R. L. 350 and at R. L. 425, with the object of disposing of the trees standing upon the bed of the lake, which will measure about 5,025 acres, before the water is impounded, and the land submerged.

55. The revision survey by the Bombay Revenue Survey Department was working in several directions in the Deccan and Konkan, and the forest reservations in each village were re-measured and all internal boundaries having been abolished, they were formed into single survey numbers in the series of the village system. The work of sub-dividing survey numbers, parts of which have been included in forest conservancy schemes and parts excluded for cultivation, was undertaken in different directions by surveyors attached to the different Forest Settlement Officers.

56. The expenditure under A. VIII c Surveys during the year amounts to Rs. 18,106-9-1.